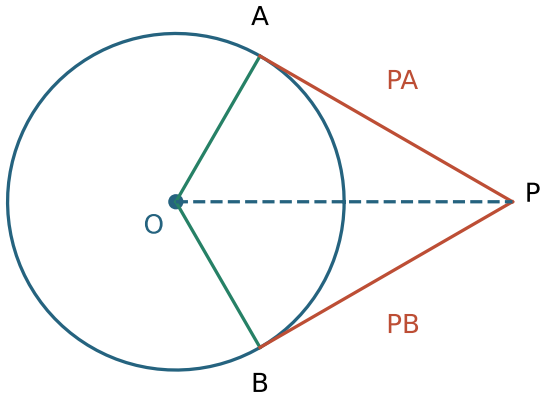
Exercise walk-through

4.1.1 Plane Shapes

AQA · GCSE · Mathematics

Figure: Congruence, similarity and circles (4)

Shared OP and equal radii → RHS → PA = PB



- Equal radii, shared OP and right angles give congruent triangles (RHS), so PA = PB
- Match each part of the diagram to the text.

Perimeter, area and volume

- Triangle: $\frac{1}{2} \times b \times h$, where h is the **perpendicular height** .
- Parallelogram: $b \times h$.
- Trapezium: $\frac{1}{2}(a+b)h$, where a and b are the parallel sides.
- Circle: $A = \pi r^2$, and the **circumference** is $C = 2\pi r = \pi d$.

$$\text{arc length} = \frac{\theta}{360} \times 2\pi r \qquad \text{sector area} = \frac{\theta}{360} \times \pi r^2$$

Pythagoras and trigonometry

- **Pythagoras' theorem.** In a right-angled triangle, $a^2 + b^2 = c^2$, where c is the **hypotenuse**, the longest side, opposite the right angle.
- A ladder whose foot is 3 m from a wall and whose top is 4 m up the wall is $\sqrt{9+16} = 5$ m long.
- **Trigonometric ratios.** Label the sides from the angle θ: opposite, **adjacent** (next to the angle) and **hypotenuse**.
- **Worked example 12.** In a right-angled triangle the hypotenuse is 23.7 cm and x is the side **adjacent** to an angle of $52°$.

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

Exercises 2.1·2.2

2.1 For each shape, write down the number of lines of symmetry and the order of rotational symmetry. [2]



2.2 Name the quadrilateral described on each card. [2]

4 equal sides and 4 right angles
exactly one pair of parallel sides

Exercises 2.1·2.2

2.1 For each shape, write down the number of lines of symmetry and the order of rotational symmetry. [2]



2.1

- A: **2** lines, order **2**
- B: **1** line, order **1**

2.2 Name the quadrilateral described on each card. [2]

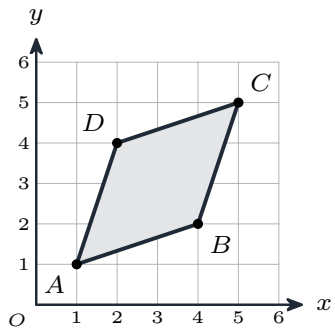
4 equal sides and 4 right angles
exactly one pair of parallel sides

2.2

- **square**
- **trapezium**

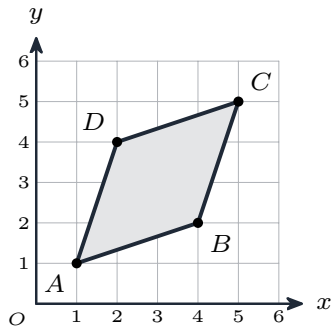
Exercise 3.1

3.1 $A(1,1)$, $B(4,2)$, $C(5,5)$ and $D(2,4)$ are drawn on the grid. Show that $ABCD$ is a rhombus but not a square. [3]



Exercise 3.1

3.1 $A(1,1)$, $B(4,2)$, $C(5,5)$ and $D(2,4)$ are drawn on the grid. Show that $ABCD$ is a rhombus but not a square. [3]



3.1

- each side is $\sqrt{3^2 + 1^2}$
- all four sides are $\sqrt{10}$, so it is a rhombus
- gradient $AB = \frac{1}{3}$ and gradient $BC = 3$, so angle B is not a right angle: not a square

Exercise 3.2 (a)

3.2 A company designs a logo and some tiles.

(a) Write down the number of lines of symmetry and the order of rotational symmetry of the logo. [2]

Exercise 3.2 (a)

3.2 A company designs a logo and some tiles.

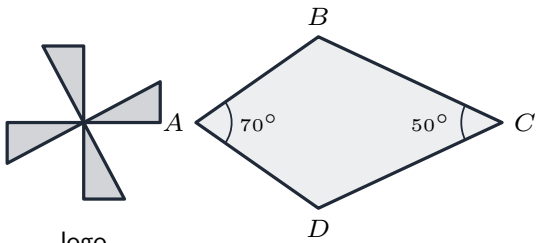
(a) Write down the number of lines of symmetry and the order of rotational symmetry of the logo. [2]

(a) **0** lines of symmetry; order **4**

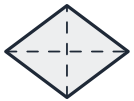
Exercise 3.2 (b)

3.2 A company designs a logo and some tiles.

(b) In the kite $ABCD$, $AB = AD$, angle $BAD = 70°$ and angle $BCD = 50°$. Work out angle ABC. Give a reason. [3]



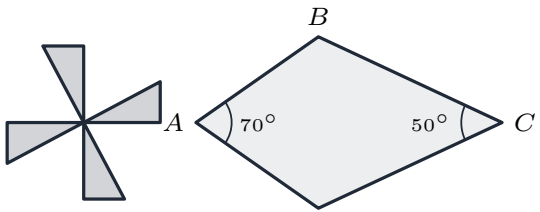
logo


6 cm and 8 cm

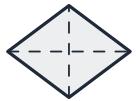
Exercise 3.2 (b)

3.2 A company designs a logo and some tiles.

(b) In the kite $ABCD$, $AB = AD$, angle $BAD = 70°$ and angle $BCD = 50°$. Work out angle ABC. Give a reason. [3]



logo



(b) a kite has one pair of equal angles: $ABC = ADC$; $360 - 70 - 50 = 240$; $ABC = \mathbf{120}°$

Exercise 3.2 (c)

3.2 A company designs a logo and some tiles.

(c) Another tile is a parallelogram. Two opposite angles are $(x + 20)^\circ$ and $(2x - 50)^\circ$. Work out x. Show that the parallelogram is a rectangle. [4]

Exercise 3.2 (c)

3.2 A company designs a logo and some tiles.

(c) Another tile is a parallelogram. Two opposite angles are $(x + 20)°$ and $(2x - 50)°$. Work out x. Show that the parallelogram is a rectangle. [4]

(c) opposite angles are equal: $x + 20 = 2x - 50$; $x = \mathbf{70}$; each angle is 90°; the other angles are $180 - 90 = 90°$, so all four are right angles: a rectangle

Exercise 3.2 (d)

3.2 A company designs a logo and some tiles.

(d) The rhombus has diagonals of 6 cm and 8 cm. Work out the length of one side, the perimeter and the area of the rhombus. [5]

Exercise 3.2 (d)

3.2 A company designs a logo and some tiles.

(d) The rhombus has diagonals of 6 cm and 8 cm. Work out the length of one side, the perimeter and the area of the rhombus. [5]

(d) the diagonals bisect at right angles: halves 3 and 4; side $\sqrt{3^2 + 4^2} = \mathbf{5}$ cm; perimeter **20** cm; area $\frac{1}{2} \times 6 \times 8 = \mathbf{24}$ cm^2